Auroral fine-scale structures formed by inertial Alfven waves

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Spatial scale of auroral fine-scale structures is ˜100m typically. However, source plasma structures which generate the fine-scale auroral emissions are still unclear. REIMEI satellite carries multi-spectral auroral camera (MAC), electron spectral analyzer (ESA) and ion spectral analyzer (ISA) to get simulataneous observations of auroral images and corresponding plasma particles with high time/spatial resolutions.

Optical fine-scale structures in auroral arcs often drift toward arc-aligned direction. In northern hemisphere, most of the structures in poleward arc move eastward, and those of equatorward arc move westward. These directions are consistent with directions of ExB drift, when U-shaped potential structure is assumed above the arcs. Although Reimei satellite does not carry field instruments with enough resolutions, one might infer perpendicular electric field orientation/strength in the auroral acceleration region, based on characteristic energies of observed precipitating electrons in Inverted-V structure. The drift directions agree with that of ExB drift inferred with electron measurements.

Electron acceleration in field-aligned direction due to dispersive Alfven waves is considered to be one of mechanisms to generate fine-scale optical auroral emissions. Numerical simulations show that the dispersive Alfven waves can make energy-time dispersions of precipitating electrons. We selected events of the electron energy-time dispersions from Reimei data set and examined drift directions of the auroral arcs at geomagnetic footprint.

We will present results of statistical analysis on the plasma structures related with the dispersive Alfven waves and corresponding optical auroral emissions.